

# ROHDE & SCHWARZ SOLUTIONS FOR THE EDUCATIONAL MARKET

**ROHDE & SCHWARZ**

Make ideas real







# ROHDE & SCHWARZ IN THE EDUCATIONAL MARKET

Test and measurement specialist Rohde & Schwarz has decades of experience in producing innovative, class-leading test and measurement solutions that guarantee high quality, compatibility and precision. With its solid technological background, Rohde & Schwarz is proud to support universities and carry the legacy of cooperation forward.

Rohde & Schwarz was founded by two PhD students, Lothar Rohde and Hermann Schwarz, who were working together at the University of Jena in Germany. Over 80 years ago, they decided to bring their mutual interest in high frequency technology into practice by opening the Physikalisch-Technisches Entwicklungslabor Dr. L. Rohde & Dr. H. Schwarz in Munich.

Ever since the company was started, Rohde & Schwarz has stayed true to the innovative enthusiasm of its young founders by creating and maintaining close connections with educational institutions. Rohde & Schwarz is committed to cultivating this highly valued cooperation by providing universities and schools with reliable and novel test and measurement solutions of high quality, ideally suited for education.

The carefully thought out product portfolio enables different use case scenarios and combinations. Consequently, Rohde & Schwarz is able to deliver a full solution for any kind of workbench. Moreover, in order to help teachers and students get the most out of the equipment, Rohde & Schwarz experts offer consultation on how to use the instruments, including visits to the customer sites when needed.

The search for synergy goes beyond providing universities with test and measurement equipment. Rohde & Schwarz considers universities and schools as partners. The company organizes guest lectures by leading experts as well as seminars and training courses for both specialists and students, and is involved in sponsoring engineering student competitions and hackathons with test equipment.

Maintaining close ties with the educational field is mutually beneficial. In addition to providing useful tools for teaching, Rohde & Schwarz is keeping up-to-date with the specific needs and peculiarities of the educational market. With one of them being budgetary restrictions, the company proactively offers special terms and discounts for the customers in the educational market.

Rohde & Schwarz wants to take part in shaping the future by inspiring students to achieve optimal results with the best available instruments. This also brings considerable benefits to the educational institutions and the students involved.

# HIGHLIGHTS OF OUR EDUCATIONAL PORTFOLIO



## R&S®RTB2000 – class-leading oscilloscope with detailed output

The R&S®RTB2000 is the perfect tool to teach students how to measure with an oscilloscope. With the “power of ten” (10-bit ADC, 10 Msample memory and 10.1” touchscreen) and a smart operating concept, it provides user swith a powerful, modern platform.

The oscilloscope features an easy-to-use concept combined with state-of-the-art technology at an affordable price.

With the R&S®RTB2000, a single instrument can be simultaneously used by several students, and reports are easy to create with the handy and flexible screen annotation tool. In addition to having the largest screen in its class, the R&S®RTB2000 offers other standout characteristics. Its 10-bit A/D converter delivers a fourfold improvement compared with conventional 8-bit converters, resulting in sharper waveforms with more signal detail that would

otherwise be missed. The instrument also features a class-leading memory depth, 10 times more than similar oscilloscopes in the same instrument class. The R&S®RTB2000 comes with a wide range of available options.

The R&S®RTB-B1 option turns every R&S®RTB2000 into an intuitive-to-use mixed signal oscilloscope (MSO) with 16 additional digital channels. The oscilloscope captures and analyzes signals from analog and digital components of an embedded design synchronously and time-correlated to each other. The R&S®RTB-B6 waveform and pattern generator is useful for educational purposes and for implementing prototype hardware. Apart from the common sine, square/pulse, ramp and noise waveforms, it outputs arbitrary waveforms and 4-bit signal patterns. Waveforms and patterns can be imported as CSV files or copied from oscilloscope waveforms. R&S®RTB-B6 also enables the use of predefined patterns.



## R&S®FPC1500 – three basic RF engineer's tools in one instrument

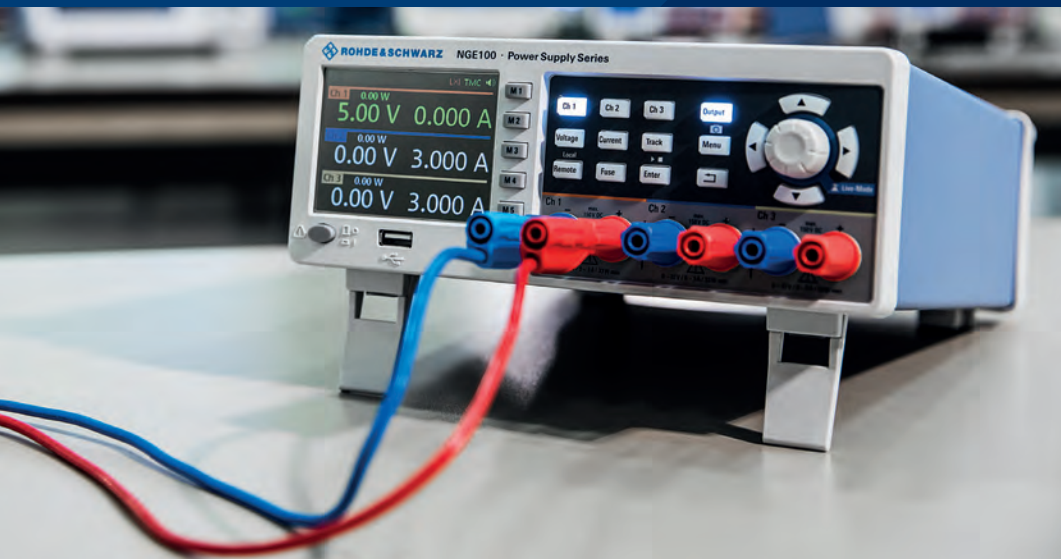
The R&S®FPC1500 spectrum analyzer provides a good introduction to the regular workflow and tools of an RF engineer since it combines the features of the three most commonly used instruments: spectrum analyzer, vector network analyzer and signal generator. It also features easy virtual control and powerful all-in-one remote control applications for PC and iOS/Android apps.

RF engineering often requires testing of passive or active RF circuits that do not produce any RF signal on their own, such as amplifiers, filters or even RF cables. A standalone spectrum analyzer is not sufficient for these tasks, requiring a signal generator. The R&S®FPC1500 features tracking generator functionality, which makes transmission measurements possible, for example in RF filter and general frequency response measurements. Due to the independent source design, even frequency conversion measurements are possible. Thanks to the unique

Rohde & Schwarz upgrade path, the R&S®FPC1500 is future-proof. It can be upgraded by simply entering a software keycode. The process is easy and it eliminates the need for additional upgrade calibration.

Ready for the teaching lab: the R&S®FPC1500 spectrum analyzer can be combined with an R&S®FPC-Z10 teaching kit. This is a universal board with a transceiver, DC/DC converter circuitry for electromagnetic interference (EMI) troubleshooting as well as an onboard calibration kit for network analysis. The easy-to-operate teaching kit guides the user through exercises step by step, providing the students with practical skills in operating test and measurement instruments. The R&S®FPC-Z10 also includes an educational feature called "Lab" that helps teachers conveniently manage, monitor and assist students with their measurements from a central or remote location.





## R&S®NGE100B power supply – reduced to the max

The R&S®NGE100B power supply series comes in a two- or three-channel version. With up to 33.6 W output power per channel, these instruments offer high efficiency combined with low ripple. All channels are galvanically isolated and earth-free.

The R&S®NGE100B power supplies allow parallel and serial operation. Because all channels are electrically equivalent, they can be combined in serial to achieve higher voltages or in parallel for higher currents. Programmable protection and safety functions make these instruments safe to use.

Color-coded operating conditions and indication of active protection functions ensure easy operation.

In an increasingly digitized world, tech-savvy students and young professionals look for easy connectivity even in the lab environment. Offering remote control via USB, Ethernet and wireless LAN, R&S®NGE100B power supplies are perfectly suited for modern educational labs.

## R&S®HMC8012 – up to three results in parallel

The R&S®HMC8012 digital multimeter features a measurement range from DC to 100kHz, performing up to 200 measurements per second. The 5 3/4-digit display simultaneously shows three different measurement functions. With a basic display accuracy of 0.015 %, it is suitable for a wide range of measuring tasks.

Current measurements across the entire range can be performed using only one connector. This eliminates any manual switching during range transfers. Twelve different measurement functions make it the perfect all-rounder on any bench setup.

# CAMPUS DASHBOARD

## R&S®CDS – control and monitoring of workbenches and instruments

Managing large student groups in a teaching environment can be difficult, complicated by the variety of workbenches and instruments in use. In order to address this challenge, Rohde & Schwarz offers the R&S®CDS campus dashboard. This single software package considerably simplifies the teacher's workflow by enabling control of the students' workbenches and instruments either individually or simultaneously as a group. R&S®CDS allows the teacher to provide identical conditions for all students, through arranging the instruments on virtual benches that can be customized to match the user's laboratory layout. The easy-to-use software can also run simultaneous firmware updates on multiple instruments with just a few clicks.

Grouping several instruments into multiple virtual benches gives a clear overview of the laboratory in the software interface, including the status of each individual instrument.

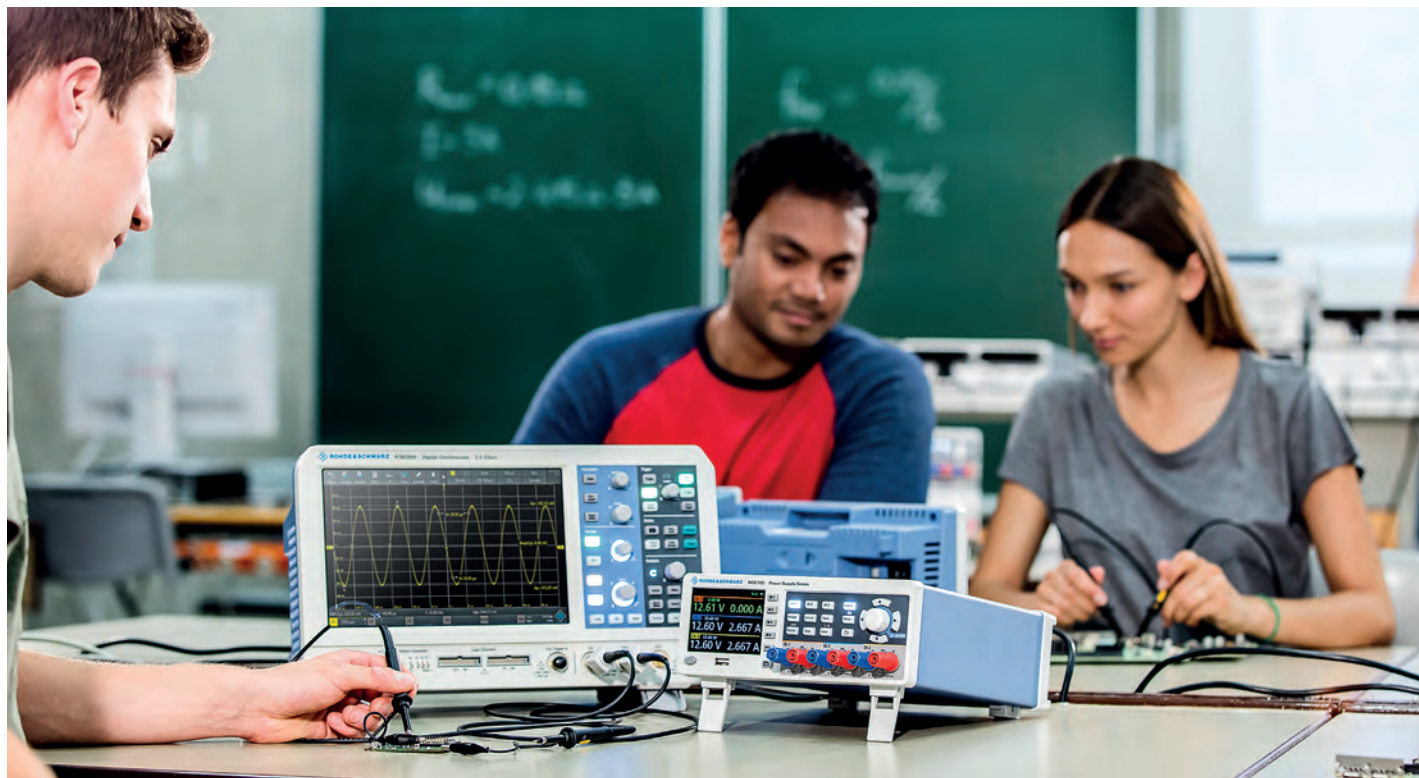
An automated search detects all supported instruments in the local network, making the initial setup process easy and fast. Alternatively, an .xml list of individual instruments can be loaded into the software.

The R&S®CDS campus dashboard remotely controls up to 300 individual instruments (oscilloscopes, spectrum analyzers, network analyzers and power supplies). Lab managers, tutors, students and professors equally benefit from its excellent usability, simplified workflows and automation capabilities.

### Supported instruments

Oscilloscopes	R&S®RTC1000, R&S®RTB2000, R&S®RTM3000, R&S®RTA4000
Spectrum analyzers	R&S®FSH, R&S®FSC, R&S®FPH, R&S®FPC1000, R&S®FPC1500
Network analyzers	R&S®ZVH, R&S®ZPH
Power supplies	R&S®NGE100, R&S®NGE100B

Other instruments on request. Please get in touch with your local Rohde & Schwarz contact.



# DISCOVER THE FULL PORTFOLIO FOR EDUCATION FROM ROHDE&SCHWARZ

In addition to the products highlighted above, Rohde&Schwarz offers educational institutions an extensive portfolio of T&M equipment that can be a good fit in your lab, from RF-basics classes to advanced-level teaching. Discover all products from the educational portfolio of Rohde&Schwarz below.



**R&S®RTC1000 oscilloscope**

- ▶ Bandwidth: 50 MHz to 300 MHz
- ▶ Max. sample rate: 2 Gsample/s
- ▶ Max. memory depth: 2 Msample
- ▶ MSO: 8 digital channels, optional, retrofittable
- ▶ Pattern generator: 4-bit patterns up to 50 Mbit/s



**R&S®RTB2000 oscilloscope**

- ▶ Four times more vertical resolution than standard 8-bit ADCs
- ▶ Bandwidth: 70 MHz to 300 MHz
- ▶ Sample rate: up to 2.5 Gsample/s
- ▶ Memory depth: up to 20 Msample
- ▶ ADC resolution: 10 bit
- ▶ Display: 10.1" capacitive touchscreen



**R&S®RTM3000 oscilloscope**

- ▶ Bandwidth: 100 MHz to 1GHz
- ▶ Sample rate: up to 5 Gsample/s
- ▶ Memory depth: up to 80 Msample
- ▶ ADC resolution: 10 bit
- ▶ Display: 10.1" capacitive touchscreen



**R&S®FPC1000 spectrum analyzer**

- ▶ RF performance engineered in Germany
- ▶ 10.1" WXGA (1366 × 768 pixel) large and high-resolution display
- ▶ Tracking generator and independent CW signal generator
- ▶ Built-in VSWR bridge
- ▶ One-port vector network analyzer with Smith chart display





#### R&S®FPC1500 spectrum analyzer

- ▶ Value of three: a spectrum analyzer, a vector network analyzer and a signal generator all in one
- ▶ More resolution than competitors and the lowest noise floor in its class
- ▶ All upgrades available via keycode, no additional calibration required
- ▶ Expandable with the R&S®FPC-Z10 teaching kit



#### R&S®NGE100B power supply

- ▶ Available with either two or three channels depending on model
- ▶ Max. output power of 66 W or 100 W depending on model
- ▶ Max. output voltage of 32 V per channel
- ▶ Overcurrent, overvoltage, overpower, overtemperature protection (OCP, OVP, OPP, OTP)
- ▶ USB interface (VCP/TMC), optional LAN (LXI), optional wireless LAN, optional digital I/O (4 bit)



#### R&S®HMC804x DC power supply

- ▶ Available with one, two or three channels depending on model
- ▶ Max. output power of 100 W
- ▶ Max. output voltage of 32 V per channel
- ▶ Galvanically isolated, floating and short-circuit-proof outputs
- ▶ Protective functions adjustable for each channel
- ▶ Ideal power supply for hardware developers and labs
- ▶ Remote control



#### R&S®HMC8012 digital multimeter

- ▶ Measurement range: DC to 100 kHz
- ▶ Resolution: 1  $\mu$ V, 100 nA, 1 m $\Omega$ , 1 pF, 1 Hz, 0.1°C/F
- ▶ Basic accuracy: 0.015 % (DC)



#### **R&S®HMF2525/2550 arbitrary function generator**

- ▶ Frequency range: 10  $\mu$ Hz to 25/50 MHz
- ▶ Triangle waveforms up to 10 MHz
- ▶ Output voltage: 5 mV to 10 V (Vpp) (into 50  $\Omega$ )
- ▶ Waveforms: sine, square, triangle/ramp, pulse, arbitrary
- ▶ Arbitrary waveform generator: 250 Msample/s, 14 bit, 256 kpoint
- ▶ PC software (free of charge) to easily create user-defined waveforms



#### **R&S®ZNLE vector network analyzer**

- ▶ Frequency range from 1 MHz to 3 GHz or 1 MHz to 6 GHz
- ▶ Two-port vector network analyzer with a full S-parameter test set for bidirectional measurements on passive components
- ▶ Wide dynamic range of up to 120 dB (typ.)
- ▶ Measurement bandwidths from 1 Hz to 500 kHz



#### **R&S®CDS teaching software for multi-user student labs**

- ▶ Campus dashboard that allows simultaneous, multiple instrument retrieval of students' results
- ▶ Controls up to 300 individual test and measurement instruments from one workplace
- ▶ Automatic connection to supported instruments in the local network
- ▶ Sets identical conditions for all student benches
- ▶ Saves settings from one instrument and distributes to all students

# CHOOSE A BENCH SET-UP THAT BEST SUITS YOUR NEEDS



## First-year electronics bench

Teach your first-year electronic engineering students how to troubleshoot their electronic design.

### Suggested equipment

- ▶ R&S®RTB2002 oscilloscope
- ▶ R&S®HMC8012 digital multimeter
- ▶ R&S®HMC8043 power supply with logging capability

List Price: ~~\$4,140.00~~  
**EDU DISCOUNT: 20%**  
 EDU Pricing: \$3,312.00

## Advanced engineering teaching lab

Equipment for your final-year undergraduate electronic engineering students and graduate-level students.

### Suggested equipment

- ▶ R&S®RTM3002 oscilloscope
- ▶ R&S®HMC8012 digital multimeter
- ▶ R&S®HMF2525 function generator
- ▶ R&S®NGE102B power supply

List Price: ~~\$7,525.00~~  
**EDU DISCOUNT: 20%**  
 EDU Pricing: \$6,020.00

## RF lab setup

Provide your students with a hands-on RF-learning experience with the RF-teaching bench.

### Suggested equipment

- ▶ R&S®FPC1500 spectrum analyzer
- ▶ R&S®FPC-Z10 RF teaching kit
- ▶ R&S®FPC-Z10 lab sheet with teaching scenarios

List Price: ~~\$3,585.00~~  
**EDU DISCOUNT: 20%**  
 EDU Pricing: \$2,868.00

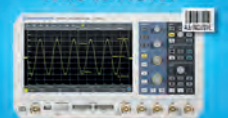


**THIS CHANGED EVERYTHING.**  
 COMPLETE SOLUTIONS FOR ONE PRICE.

That was then.



This is now.





### Service that adds value

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

### Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

Certified Quality Management  
**ISO 9001**

Certified Environmental Management  
**ISO 14001**

### Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

### Regional contact

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